REMARKS

Rejection of Claims 1, 2, 4-6, 8-15 and 17-23 under 35 U.S.C. § 102(b)

Claims 1, 2, 4-6, 8-15, and 17-23 have been rejected as being anticipated by US 5589690 (Siewert). Applicants respectfully disagree.

Claim 1 of the present application recites:

"An X-ray diffraction method for the analysis of polycrystalline materials, the method comprising:

(a) providing a polycrystalline material for analysis;

(b) providing a polychromatic X-ray source, wherein the source produces X-rays by accelerating charged particles to energies of no more than 1 MeV;

(c) collimating X-rays from the polychromatic X-ray source into a beam having a divergence in the range of from 10^{-4} to 10^{-2} radians;

(d) exposing at least a portion of the polycrystalline material to the collimated X-ray beam, whereby the beam is diffracted;

(e) collecting at least some of the diffracted X-rays in an energy dispersive X-ray detector or array; and

(f) analysing the collected, diffracted X-rays."

Applicants respectfully submit that Siewert does not anticipate the present claims, at least because Siewert does not disclose feature (c) in claim 1. The passages in Siewert to which the Office Action refers (column 4, lines 43-46, column 6, lines 66-67, and column 7, lines 1-12) do not disclose *"collimating X-rays from the polychromatic X-ray source into a beam having a divergence in the range of from 10^{-4} to 10^{-2} radians"*. It is submitted that Siewert does not provide any quantitative information regarding the beam divergence and does not anticipate the claimed range of 10^{-4} to 10^{-2} radians.

Siewert is concerned with monitoring the interface between a molten and solidified crystalline phase in a furnace during a casting process (see the abstract). The disclosed method differentiates between the solid (crystalline) and liquid (amorphous) parts by the nature of the diffraction patterns (i.e., the presence of diffraction peaks from the crystalline phase). Siewert is therefore primarily concerned with monitoring a casting process. In contrast, the focus of the present application is mapping sub-surface stresses and strains in engineering components.

The method according to Siewert relies on straight transmission, i.e., absorption imaging (see Figure 1). In contrast, the present application describes x-ray scattering (diffraction) by a Bragg angle that is defined by collimation. Such a method is different from Siewert in that it provides beam path definition suitable for quantitative pattern

analysis. Unlike Siewert, the method described in the present application involves the quantitative interpretation of the centre position of crystalline diffraction peaks.

Siewert does not use Bragg's law for quantitative analysis of crystal structure and/or lattice spacing and strain/stress. In contrast, the method according to the present invention enables one to perform quantitative analysis of the relationship between the interplanar lattice spacing, the diffracted beam energy, and the diffracted angle. Hence the importance of collimating X-rays from the polychromatic X-ray source into a beam having a divergence in the range of from 10^{-4} to 10^{-2} radians.

Applicants also respectfully disagree with the suggestion in the Office Action that Siewert teaches analyzing the collected, diffracted x-rays to map the lattice parameter in the polycrystalline material (see page 3 of the Office Action). The Office Action refers in this regard to the passage in Siewert in Column 10, lines 1-46. However, Applicants respectfully submit that this passage merely confirms that Siewert is concerned with *"solidification processes", "growth of semiconductor boules"* and *"chemical precipitation processes"* (see lines 16-20). These processes are all concerned with monitoring the interface between a molten/liquid phase and a solid phase. Nowhere in this passage in Siewert is it suggested to analyze the collected, diffracted x-rays to map the lattice parameter in a polycrystalline material.

With regard to claim 21, this claim recites:

> *"A method of quantitatively mapping the sub-surface distribution of the crystal lattice parameter in a polycrystalline material, the method comprising:*
>
> *(a) providing a sample for analysis, wherein the sample comprises a polycrystalline material;*
>
> *(b) providing a polychromatic X-ray source, wherein the source produces X-rays by accelerating charged particles to energies of no more than 1 MeV;*
>
> *(c) collimating X-rays from the polychromatic X-ray source into a beam having a divergence in the range of from 10^{-4} to 10^{-2} radians, and a penetration depth of $\geq$ 1 mm;*
>
> *(d) scanning the collimated X-ray beam across the sample, whereby the beam is diffracted;*
>
> *(e) collecting at least some of the diffracted X-rays in an energy dispersive X-ray detector or array; and*
>
> *(f) analysing the collected, diffracted X-rays to map the lattice parameter in the polycrystalline material."*

Dependent claim 23 recites:

> *"A method as claimed in claim 21, further including:*

(g) transforming the map of the lattice parameter into a map of sub-surface engineering stresses and/or strains."

The submissions above in relation to claim 1 are also applicable to independent claim 21 since, as noted, Siewert does not disclose, *e.g.,* feature (c). Nor does Siewert disclose, *e.g.,* feature (f). As already noted, the passage to which the Office Action refers (Column 10, lines 10-46) is silent regarding analysing the collected, diffracted X-rays to map the lattice parameter in the polycrystalline material.

Applicants also respectfully disagree with the suggestion in the Office Action that Siewert anticipates claim 23. There is no teaching or suggestion in Siewert to transform the map of the lattice parameter into a map of sub-surface engineering stresses and/or strains. Siewert merely talks about detecting the formation of a second crystalline phase in a crystalline structure and detecting defects in the crystal structure of a crystalline phase during casting.

Accordingly, claims 1, 2, 4-6, 8-15, and 17-23 are novel over Siewert. Applicants request reconsideration and withdrawal of these rejections under 35 U.S.C. § 102(b).

Rejection of Claims 3, 7 and 16 under 35 U.S.C. § 103(a)

The Examiner has rejected claims 3, 7 and 16 as being obvious over Siewert in view of Canberra Capabilities Profile Brochure, US 4,561,062 and WO 91/08372, respectively. Applicants respectfully disagree and note that, according to MPEP § 706.02(j), "35 USC §103 authorizes a rejection where, ***to meet the claim***, it is necessary to modify a single reference or to combine it with one or more other references."

Applicants respectfully submit that a *prima facie* case of obviousness has not been established, at least because the cited prior art references, when combined, do not teach or suggest all of the claim limitations. As discussed above, Siewert does not anticipate independent claim 1. The references, Canberra Capabilities Profile Brochure, US 4,561,062 and WO 91/08372 are of secondary relevance, have only been cited against dependent claims 3, 7 and 16 and do not make up for the deficiencies in Siewert. As such, the cited art fails to teach or suggest all of the claim limitations.

Accordingly, Applicant requests reconsideration and withdrawal of these rejections under 35 U.S.C. § 103(a).

SUMMARY

In view of the remarks set forth above, it is respectfully submitted that this application is in condition for allowance. If there are any remaining issues or the Examiner believes that a telephone conversation with Applicants' Attorney would be helpful in expediting prosecution of this application, the Examiner is invited to call Danielle L. Herritt, Esq. at (617) 449-6513.

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Respectfully submitted,

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